coil system located in circuit as a differential choke system since regions having different iron saturation in the core, such saturation being due to permanent magnets of the armature, cause changes in inductance and owing to the motion of the armature are correspondingly shifted and wherein a processing and evaluating means is provided for ascertaining the inductance variations of the inductance parts of the differential choke system and from this the position of the armature.

IN THE ABSTRACT:

At page 16, please remove "Figure 1" at line 17.

REMARKS

The non-final Office Action mailed August 29, 2002 and the references cited therein have been carefully considered. The specification, Claims 7 and 11, and the abstract have been amended in a sincere effort to further clarify that which Applicant regards as the invention.

Support for this Amendment is found generally within the specification, claims, and drawings, as originally filed. As a result of this Amendment taken together with the remarks set forth below, it is respectfully submitted that pending Claims 1-11 are now before the Examiner in condition for favorable consideration and allowance.

In the Office Action, Claim 11 was objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Although the Office Action originally indicated that Claim 10 was conditionally allowable, a telephonic interview with Examiner confirmed that it is Claim 11 that is conditionally allowable. The Applicant would like to take this opportunity to thank the Examiner for conducting a telephonic interview with the undersigned and acknowledges and gratefully appreciates the conditional allowance of Claim 11. Accordingly, Claim 11 has been amended to include limitations of the base claim and any intervening claims.

Claim 7 was rejected under 35 U.S.C. § 112. Specifically, the Examiner indicates that there is insufficient antecedent basis for the phrase "cylindrically wound". Accordingly, Claim 7 has been amended to explicitly recite that the drive coil system is cylindrically wound. Therefore, it is respectfully requested that the rejection of Claim 7 under 35 U.S.C. § 112 be reconsidered and withdrawn.

Claims 1-7, 9, and 10 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,734,209 to Hallidy (*Hallidy*). Specifically, the Examiner states that *Hallidy* describes each of the elements recited in Claim 1.

The subject invention is directed to an electrodynamic linear drive comprising a drive coil system and composed of coils arranged in a row alongside each other on an elongated ferromagnetic core. The coil system is able to be supplied with a switched exciting voltage and a ferromagnetic tube fits around the drive coil system. A plurality of permanent magnets is arranged on the inner side of the tube in a row alongside each other in the longitudinal direction of the tube. The core is provided with a drive coil system and designed as a stator. The tube is provided with permanent magnets and designed as an armature, as defined by Claim 1.

Hallidy relates to a linear motor that includes a hollow elongated mover and a stator having a plurality of annular teeth, as shown in Figure 5. Electrical coils are wound from single wires extending from outside the assembly in the spaces between the teeth to eliminate the need for electrical connections between the coils. The stator assembly and mover are dimensioned to fit within the hollow interior of a ferromagnetic tube, such as the drilling tube of an oil well, as shown in Figure 1.

However, in *Hallidy*, the coil 32 surrounds the magnets 21, 22, rather than the magnets surrounding the coil, as defined by Claim 1. Thus, the motor described in *Hallidy* is more sensitive to damage from the surrounding well tubing 14. Moreover, the well tubing 14 in *Hallidy* is the stator, rather than the armature, as defined by Claim 1, since it is the well tubing in *Hallidy* that must remain stationary.

Claims 8 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Hallidy* in view of U.S. Patent No. 6,160,338 to Ono (*Ono*). Specifically, the Examiner indicates that although *Hallidy* teaches a linear electrodynamic drive that includes a displacement measuring system integrated in the housing, *Ono* discloses such an electrodynamic drive that includes a displacement measuring system at column 5, lines 27-29.

Ono relates to a transport device for holding and moving conductive planar objects. The apparatus includes floating-use electrodes, to which a potential difference is applied for producing electrostatic forces that position the object in a non-contact state; driving-use electrodes to which potential differences are applied to cause currents to flow in portions of the objects that face these electrodes; and magnetic devices for generating fields that interact with the currents to produce drive forces acting on the object. The apparatus also includes displacement sensors for measuring the position of the object in a two-dimensional plane, which is parallel to the carrying surface, and a controller for monitoring the potential differences applied to the electrodes and the intensity of the magnetic fields based on the output of the displacement sensors.

However, *Ono* describes the use of displacement sensors that measure displacement in a two-dimensional plane, rather than the one-dimensional plane of the linear shaft in the subject invention. The displacement sensors in *Ono* are used to adjust the strength of the

electric and magnetic fields for positioning an object to be moved, such as a semiconductor wafer, as described at column 10, line 24 through column 11, line 55. Thus, nothing in *Ono* would teach or suggest integrating a displacement measuring system in a linear drive, as defined by Claims 8 and 10.

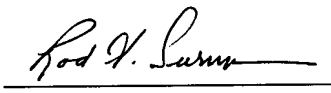
Applicant respectfully notes that in order to support a claim of *prima facie* anticipation, a single reference must teach or enable each of the claimed elements as arranged in the claim interpreted by one of ordinary skill in the art. Further, in order to support a claim of *prima facie* obviousness, the cited references must teach or suggest each and every element of the invention, and there must be a motivation in the references or the prior art to combine the references and the prior art as suggested.

However, nothing in the art of record would teach or suggest, either alone or in combination, a direct electrodynamic linear drive comprising a drive coil system and composed of coils arranged in a row alongside each other on an elongated ferromagnetic core. The coil system is able to be supplied with a switched exciting voltage and a ferromagnetic tube fits around the drive coil system. A plurality of permanent magnets is arranged on the inner side of the tube in a row alongside each other in the longitudinal direction of the tube. The core is provided with a drive coil system and designed as a stator, and the tube is provided with permanent magnets and designed as an armature, as defined by Claim 1.

Applicant respectfully submits that Claims 2-10 are patentable over the art of record by virtue of their dependency from Claim 1. Further Applicant submits that Claims 2-10 define additional patentable subject matter in their own right. Therefore, it is respectfully requested that the rejection of Claims 1-7, 9, and 10 under 35 U.S.C. § 102(b) and the rejection of Claims 8 and 10 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

In view of the foregoing Amendment and remarks, entry of the amendments to Claims 7 and 11, favorable consideration of Claims 7 and 11, as amended, favorable reconsideration of Claims 1-6 and 8-10, and allowance of pending Claims 1-11 are respectively and earnestly solicited.

Respectfully submitted,



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VERSION OF AMENDMENT WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

At page 4, replace the paragraph beginning at line 19 with the following:

Figure 2 shows part of a similar arrangement in the case of which the axial [ldength] length of the drive coil system is larger than that of the permanent magnet arrangement.

At page 7, replace the paragraph beginning at line 9 with the following:

The drive coil system 15 may be single or multi-strand in structure, the corresponding coil strands alternating axially respectively in their direction of winding. The coil width should be selected in a manner dependent on the width of the magnets 13 employed in accordance with the division of the whole number of coil strands. This means that in the case of the two strand drive coil system [15represented] 15, represented in the working example of the invention, the width of a coil part is equal to half the width of a magnet 13. In the case of use of multi-strand coil systems commutation of the coil strands is necessary in accordance with their positions in relation to the magnets 13 of the armature. Such an inherently known commutating arrangement is not illustrated in detail and may be electronic or mechanical.

At page 9, replace the paragraph beginning at line 26 with the following:

In order to be able to now use the principle of integrated displacement measurement, it is necessary for the drive coil system 25 and, respectively, 15 to be so designed that a differential choke system is produced. This will be explained with reference to figure 3 and two coil parts 29 and 30 of the drive coil system 25 and, respectively, 15 used in the working embodiment of the invention. In the case of this two strand coil system employed in the working example, in which in the axial direction every second coil part 29 and 30 as connected in series leads to one strand, these coil parts 29 and 30 are again divided up into coil regions 29a and 29b and also respectively 30a and 30b and so wound that there is a strand divided into two arts in which every first region part 29a of a coil part 29 is placed in circuit with every further first coil region 30a of a coil part 30 of the same strand in series to produce a half strand (the supply strand) and every second coil region 29a and 29b of the coil part 29 and 30 is placed in series with one second half strand (the return strand). The connection point between the supply and return strands is also made available as a center tap terminal 31 between the end terminals 32 and 33.

IN THE CLAIMS:

Please amend Claims 7 and 11 by rewriting the same as follows:

7. (Amended) The direct linear drive as set forth in claim 1, wherein the [cylindrically wound] drive coil system is cylindrically wound and has one or more strands, and in the case of there being several coil strands such strands are placed in sequence with axially alternating directions of winding on the core.

11. (Amended) An electrodynamic direct linear drive comprising a drive coil system [composed of] comprising coils arranged in a row alongside each other on an elongated ferromagnetic core, which coil system is able to be supplied with a switched exciting voltage, a permanent magnet arrangement designed in the form of an armature and [made up] comprised of a plurality of permanent magnets placed alongside one another in a longitudinal direction, such arrangement being able to be slid in relation to a winding system, the drive coil system also being a component of a displacement measuring system for the armature, [more particularly as set forth in claim 10,] which has the drive coil system located in circuit as a differential choke system since regions having different iron saturation in the core, such saturation being due to permanent magnets of the armature, cause changes in inductance and owing to the motion of the armature are correspondingly shifted and wherein a processing and evaluating means is provided for ascertaining the inductance variations of the inductance parts of the differential choke system and from this the position of the armature.

IN THE ABSTRACT:

At page 16, please remove "Figure 1" at line 17.